

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 7,049,629 B2
APPLICATION NO. : 10/646389
DATED : May 23, 2006
INVENTOR(S) : Yiliang Wu et al.

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It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

The entire set of claims starting at Column 30, Line 29 and ending at Column 38, Line 43 should appear as follows:

1. An electronic device containing a thienylene-arylene polymer consisting of a repeating segment containing at least one 2,5-thienylene units of (I) and one arylene unit of (IIIa)



(I)

(IIIa)

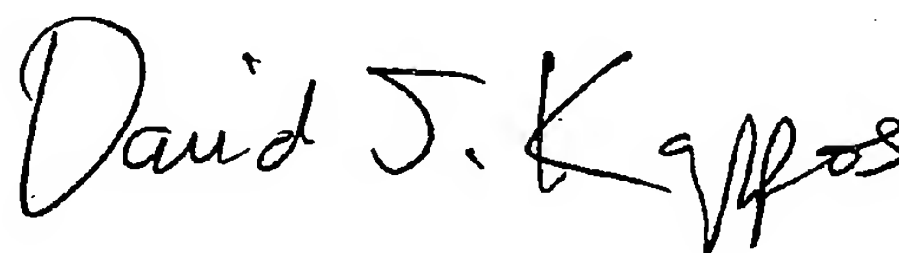
wherein each R is independently an alkoxy side chain; and a represents the number of R groups and a is 2.

2. A device in accordance with **claim 1** wherein each R contains from about 1 to about 25 carbon atoms.

3. A device in accordance with **claim 1** wherein R is alkyl or alkoxy selected from the group consisting of pentyl, pentyloxy, hexyl, hexyloxy, heptyl, heptyloxy, octyl, octyloxy, nonyl, nonyloxy, decyl, decyloxy, undecyl, undecyloxy, dodecyl, dodecyloxy, tridecyl, tridecyloxy, tetradecyl, tetradecyloxy, pentadecyl, and pentadecyloxy.

Signed and Sealed this

Twenty-fifth Day of May, 2010



David J. Kappos
Director of the United States Patent and Trademark Office

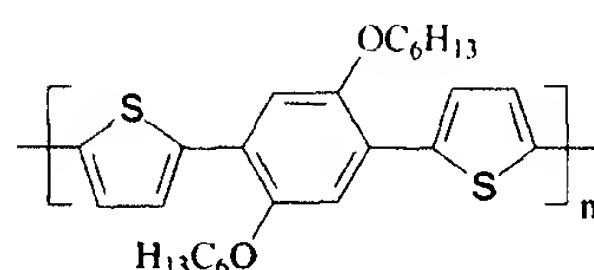
4. A device in accordance with **claim 7** wherein dialkoxyphenylene is selected from the group consisting of bis(pentyloxy)phenylene, bis(hexyloxy)phenylene, bis(heptyloxy)phenylene, bis(nonyloxy)phenylene, bis(undecyloxy)phenylene, bis(dodecyloxy)phenylene, bis(tridecyloxy)phenylene, bis(tetradecyloxy)phenylene, and bis(pentadecyloxy)phenylene.

5. A thin film transistor comprised of a substrate, a gate electrode, a gate dielectric layer, a source electrode and a drain electrode, and a semiconductor layer comprised of the thienylene-arylene polymer of **claim 1**.

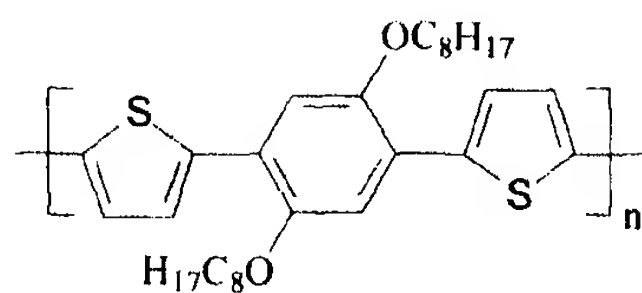
6. A thin film transistor in accordance with **claim 5** wherein R is alkoxy containing from about 5 to about 25 carbon atoms.

7. (Original) A thin film transistor in accordance with **claim 5** wherein said dialkoxyphenylene is selected from the group consisting of bis(pentyloxy)phenylene, bis(hexyloxy)phenylene, bis(heptyloxy)phenylene, bis(nonyloxy)phenylene, bis(undecyloxy)phenylene, bis(dodecyloxy)phenylene, bis(tridecyloxy)phenylene, bis(tetradecyloxy)phenylene, and bis(pentadecyloxy)phenylene.

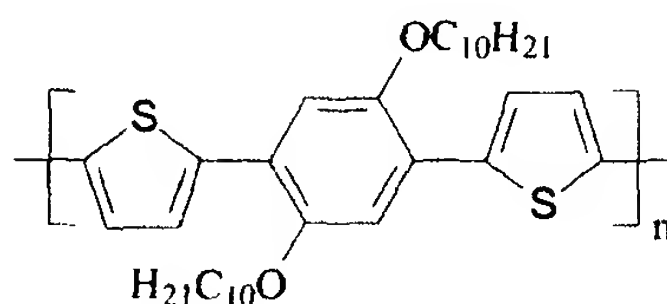
8. A thin film transistor comprised of a substrate, a gate electrode, a gate dielectric layer, a source electrode, a drain electrode, and a semiconductor layer comprised of a polymer selected from a thienylene-arylene semiconductor polymer (1) through (5)



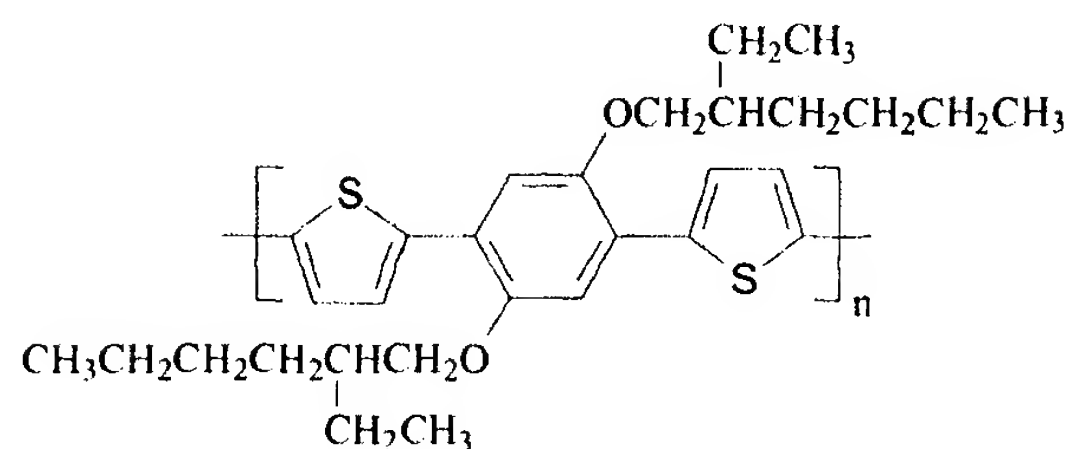
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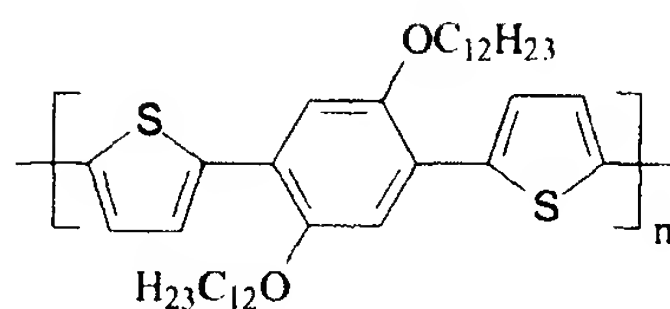
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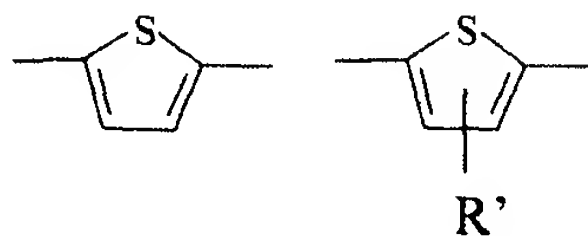


(5)

wherein n is from about 5 to about 500.

9. An electronic device containing a thienylene-arylene polymer consisting of a repeating segment containing at least one 2,5-thienylene segment and at least one arylene segment, wherein the number of said arylene segments is from about 1 to about 3.

10. The electronic device of **claim 9** wherein the 2,5-thienylene segment comprises at least one 2,5-thienylene unit of (I) or (II)

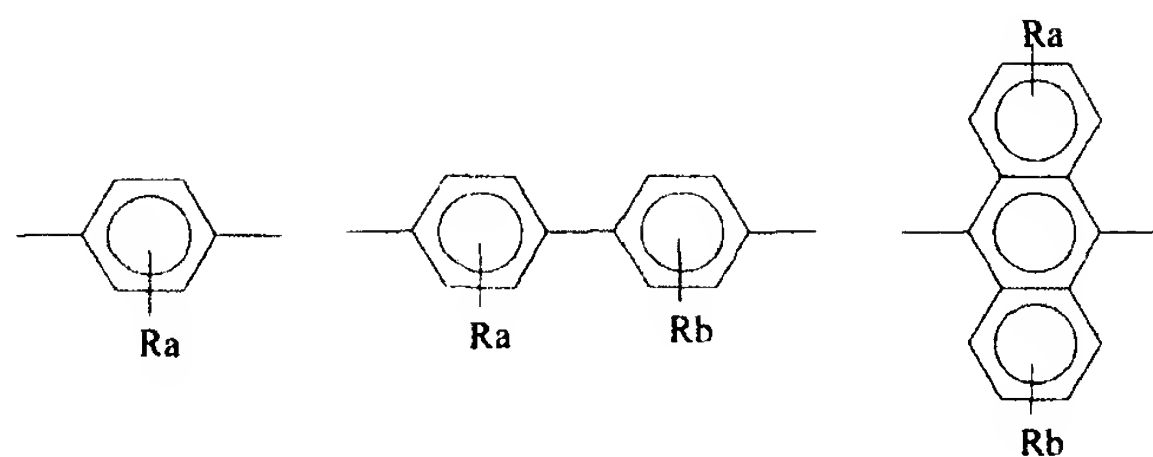


(I)

(II)

wherein R' is halogen, alkyl, or alkoxy.

11. The electronic device of **claim 9** wherein the arylene segment comprises at least one arylene unit of (IIIa), (IIIb), or (IIIc)



(IIIa)

(IIIb)

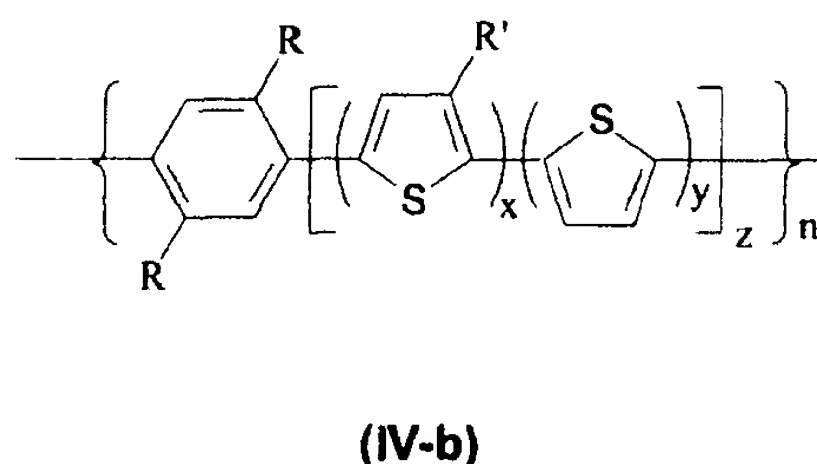
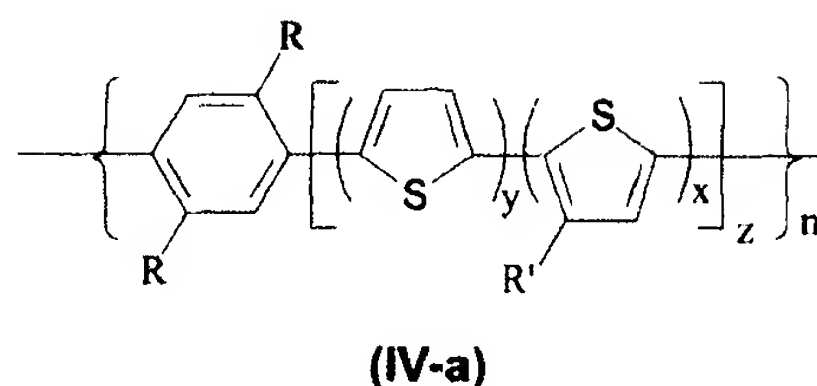
(IIIc)

wherein each R is independently an alkyl or an alkoxy side chain; and a and b represent the number of R groups, and wherein the number of said arylene units (IIIa), (IIIb), and (IIIc) is from about 1 to about 3.

12. A device in accordance with **claim 2** wherein a and b are 1 or 2.

13. A device in accordance with **claim 1** wherein R' is alkyl or alkoxy selected from the group consisting of methyl, methoxy, ethyl, ethoxy, propyl, propoxy, butyl, butoxy, pentyl, pentyloxy, hexyl, hexyloxy, heptyl, heptyloxy, octyl, octyloxy, nonyl, nonyloxy, decyl, decyloxy, undecyl, undecyloxy, dodecyl, dodecyloxy, tridecyl, tridecyloxy, tetradecyl, tetradecyloxy, pentadecyl, and pentadecyloxy.

14. A device in accordance with **claim 1** wherein said arylene is a dialkylphenylene or dialkoxyphenylene.
15. A device in accordance with **claim 1** wherein arylene is dialkoxyphenylene.
16. A device in accordance with **claim 1** wherein said arylene is dialkylphenylene.
17. A device in accordance with **claim 9** wherein said dialkylphenylene is selected from the group consisting of dipentylphenylene, dihexylphenylene, diheptylphenylene, dioctylphenylene, dinonylphenylene, didecylphenylene, bis(undecyl)phenylene, bis(dodecyl)phenylene, bis(tridecyl)phenylene, bis(tetradecyl)phenylene, and bis(pentadecyl) phenylene.
18. A thin film transistor in accordance with **claim 5** wherein R' is halogen of a chlorine or bromine atom.
19. A thin film transistor in accordance with **claim 5** wherein a and b are independently 1 or 2.
20. A thin film transistor in accordance with **claim 5** wherein arylene is a dialkylphenylene or a dialkoxyphenylene.
21. A thin film transistor comprised of a substrate, a gate electrode, a gate dielectric layer, a source electrode, a drain electrode, and a semiconductor layer comprised of a polymer represented by Formula (IV-a) or (IV-b)



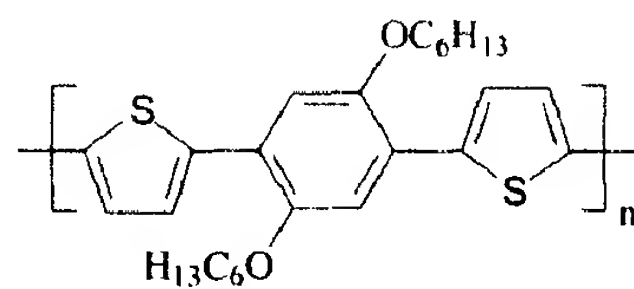
wherein R is an alkyl or alkoxy of from about 5 to about 25 carbon atoms; R' is halogen, alkyl or alkoxy, each with about 1 to about 30 carbon atoms; x and y represent the number of segments and are optionally from 0 to about 10, provided that the sum of x and y is at least equal to 1; z is about 1 to about 5, and n is the degree of polymerization, or the number of repeating segments in said polymer, and wherein said n is optionally from about 5 to about 500.

22. A thin film transistor in accordance with **claim 21** wherein R is pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentyldecyl, pentyloxy, hexyloxy, heptyloxy, octyloxy, nonyloxy, decyloxy, undecyloxy, dodecyloxy, tridecyloxy, tetradecyloxy, or pentadecyloxy.

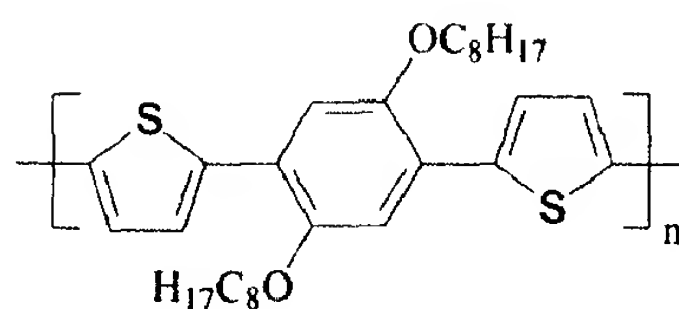
23. A thin film transistor in accordance with **claim 21** wherein R' is methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentyldecyl, methoxy, ethoxy, propoxy, butoxy, pentyloxy, hexyloxy, heptyloxy, octyloxy, nonyloxy, decyloxy, undecyloxy, dodecyloxy, tridecyloxy, tetradecyloxy, or pentadecyloxy.

24. A thin film transistor in accordance with **claim 21** wherein x, y and z are each independently from about 1 to about 5.

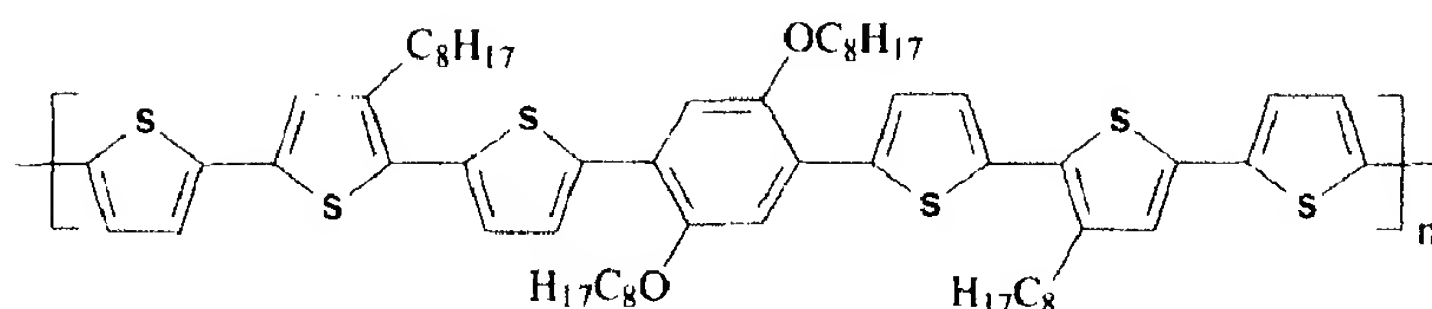
25. A thin film transistor in accordance with **claim 21** wherein said polymer is a thienylene-arylene semiconductor selected from (1) through (15)



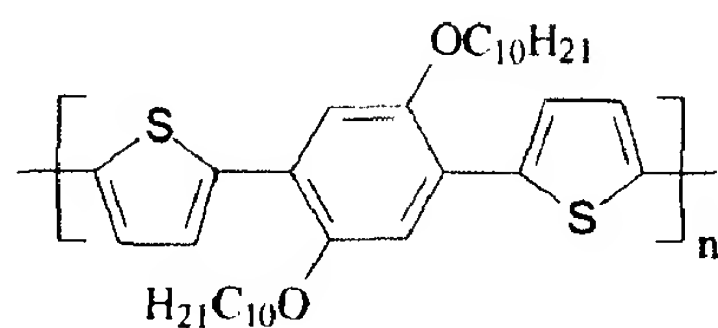
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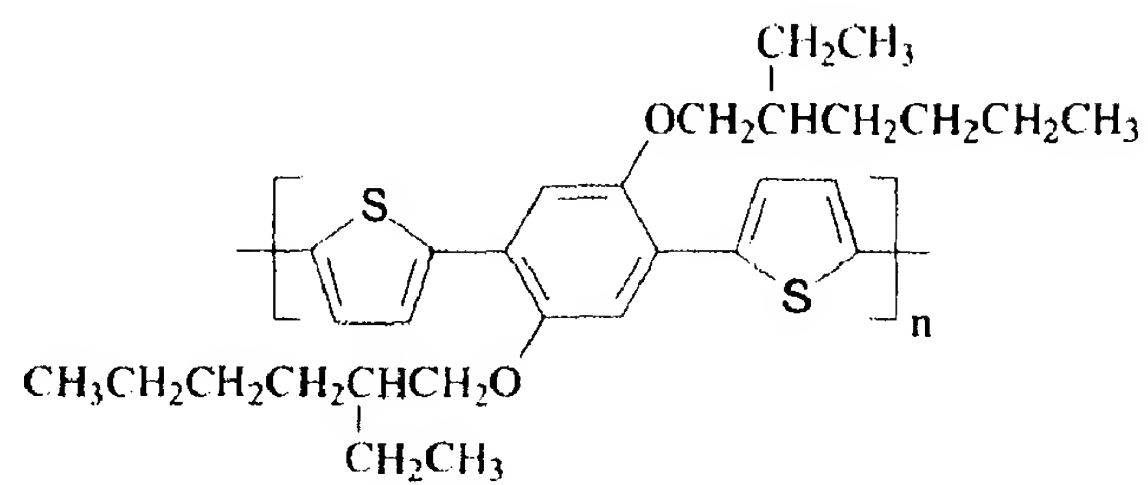
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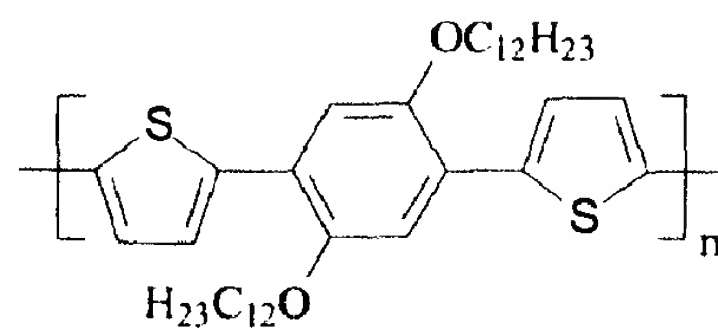
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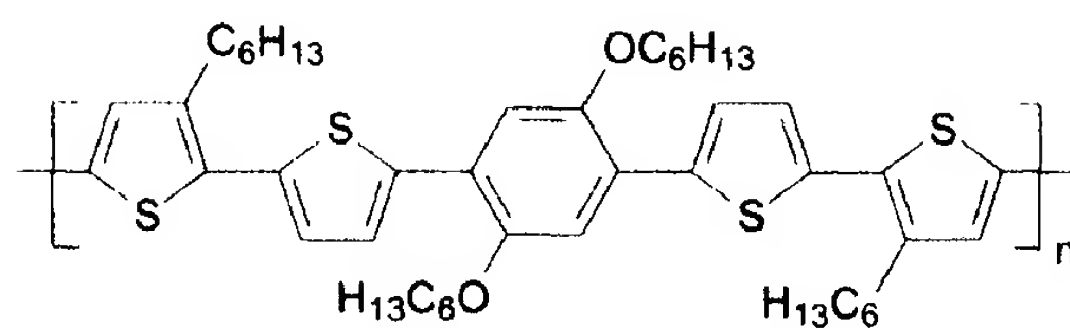
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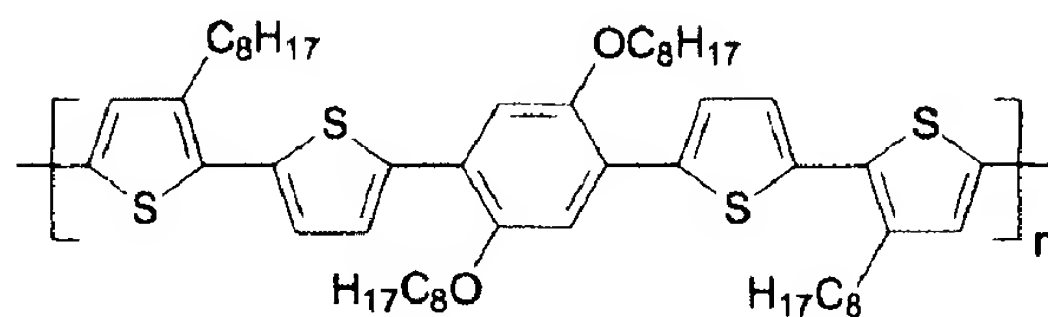
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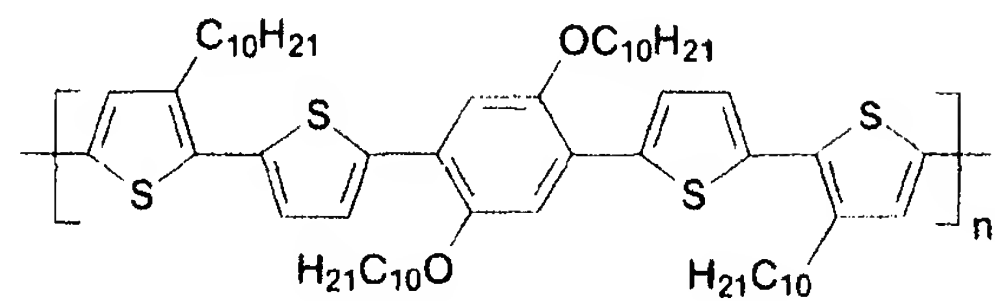
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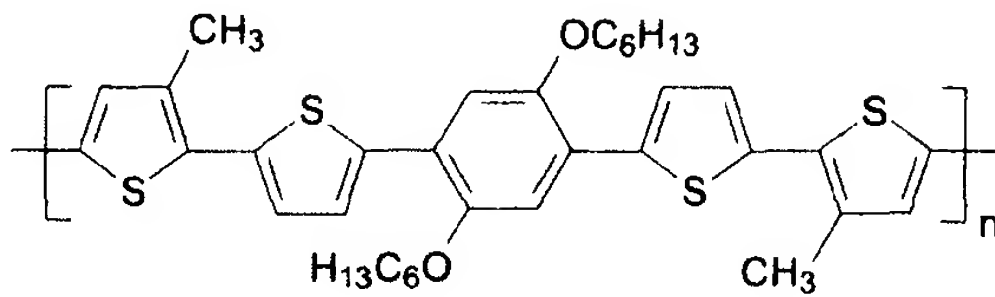
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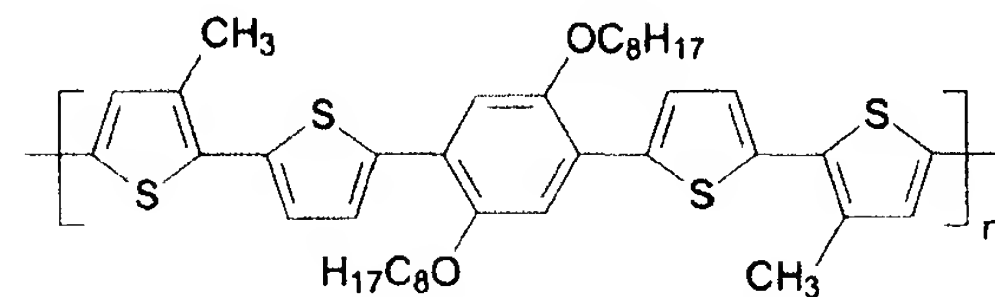
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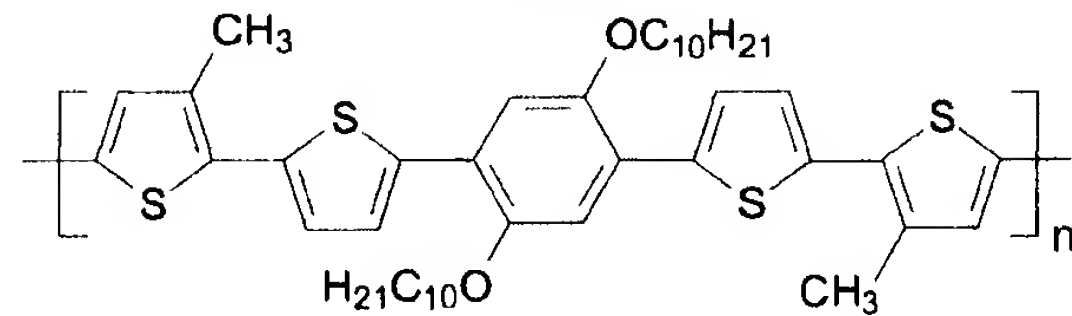
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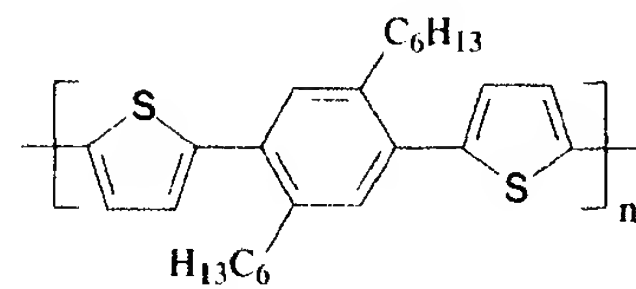
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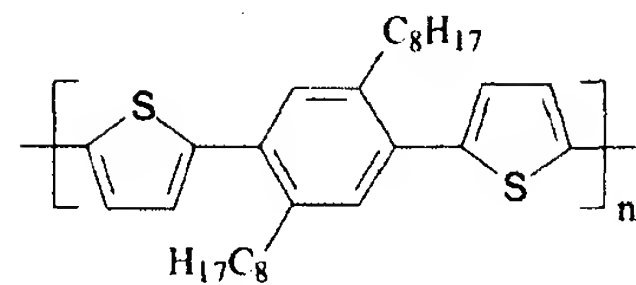
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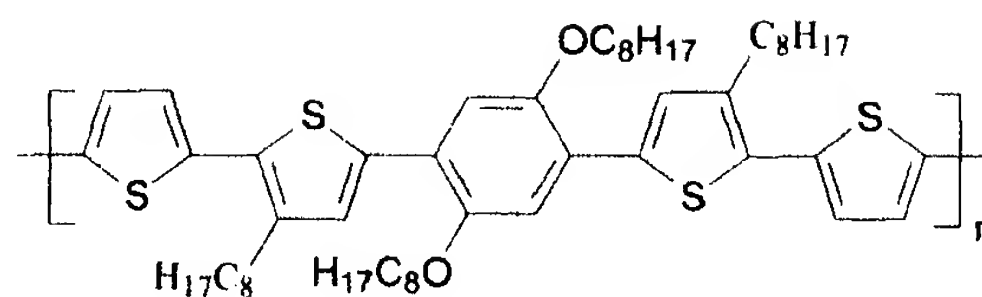
(12)



(13)



(14)



(15)

wherein n is from about 5 to about 200.

26. A thin film transistor in accordance with **claim 8** wherein said polymer is a thienylene-arylene semiconductor polymer selected from the group consisting of semiconductor polymer (2), (4), (6), (7), (8), (9), (10), (11), (12), (17), (18), and (19) wherein n is from about 25 to about 160.

27. A thin film transistor in accordance with **claim 21** wherein said substrate is a plastic sheet of a polyester, a polycarbonate, or a polyimide; said gate, source, and drain electrodes are each independently comprised of gold, nickel, aluminum, platinum, indium titanium oxide, a conductive polymer, a conductive ink or paste comprising a dispersion of conductive particles in a dispersing medium, and said gate dielectric layer is comprised of silicon nitride, silicon oxide, insulating polymers of a polyester, a polycarbonate, a polyacrylate, a poly(methacrylate), a poly(vinyl phenol), a polystyrene, a polyimide, an epoxy resin, an inorganic-organic composite material of nanosized metal oxide particles dispersed in a polymer, a polyimide, or an epoxy resin; and wherein said source/drain electrodes and said gate dielectric layer are in contact with said semiconductive layer.

28. A thin film transistor in accordance with **claim 21** wherein said substrate is glass or a plastic sheet; said gate, source and drain electrodes are each independently comprised of gold; said gate dielectric layer is comprised of an organic polymer of poly(methacrylate), polyacrylate, poly(vinyl phenol), polystyrene, polyimide, polycarbonate, or a polyester, and wherein said source/drain electrodes and said gate dielectric layer are in contact with said semiconductive layer.

29. A thin film transistor in accordance with **claim 21** wherein said polymer is a thienylene-arylene semiconductor layer formed by the solution process of spin coating, stamp printing, screen printing, or jet printing, and wherein said source/drain electrodes and said gate dielectric layer are in contact with said semiconductor layer.

30. A thin film transistor device in accordance with **claim 21** wherein said gate, source and drain electrodes, dielectric, and semiconductor layers are formed from components deposited by solution processes of spin coating, solution casting, stamp printing, screen printing, and jet printing, and wherein said source/drain electrodes and said gate dielectric layer are in contact with said polymer layer.

31. A thin film transistor device in accordance with **claim 21** wherein the substrate is a plastic sheet of a polyester or a polycarbonate, and the gate, source and drain electrodes are comprised of conductive polymers of polystyrene sulfonate-doped poly(3,4-ethylenedioxythiophene) or a conductive ink or paste of a colloidal dispersion of a metal of silver or gold in a binder, and the gate dielectric layer is an organic polymer or an inorganic oxide particle-polymer composite, and wherein said source/drain electrodes and said gate dielectric layer are in contact with said polymer layer.

32. A thin film transistor device in accordance with **claim 21** wherein n is from about 50 to about 500, or from about 100 to about 350.

33. A thin film transistor in accordance with **claim 21** wherein the number average molecular weight (M_n) of (IV-a) or (IV-b) is from about 2,000 to about 100,000, and the weight average molecular weight (M_w) thereof is from about 4,000 to about 300,000, each as measured by gel permeation chromatography using polystyrene standards.

34. A thin film transistor in accordance with **claim 21** wherein the number average molecular weight (M_n) of (IV-a) or (IV-b) is from about 10,000 to about 50,000 and the weight average molecular weight (M_w) thereof is from about 15,000 to about 100,000.

35. A thin film transistor in accordance with **claim 21** wherein the thickness of the substrate is from about 500 micrometers to about 2 millimeters; the thickness of the gate dielectric layer is from about 100 nanometers to about 500 nanometers; the thickness of the polymer semiconductor layer is from about 50 nanometers to about 100 nanometers; and the thickness of the gate, source and drain electrode layer are each from about 50 nanometers to about 1 micrometer.

36. A device in accordance with **claim 1** wherein said arylene is a dialkoxyphenylene of bis(octyloxy)phenylene, or bis(decyloxy)phenylene.

37. A device in accordance with **claim 16** wherein said dialkylphenylene, or didecylphenylene.

38. A device in accordance with **claim 15** wherein said dialkylphenylene is dioctylphenylene.

39. A device in accordance with **claim 20** wherein said dialkylphenylene is dioctylphenylene, didecylphenylene, bis(octyloxy)phenylene, or bis(decyloxy)phenylene.

40. A device in accordance with **claim 1** wherein at least one is from 1 to about 50.

41. A device in accordance with **claim 1** wherein at least one is from about 5 to about 100.

42. A device in accordance with **claim 1** wherein at least one is 1.

43. A device in accordance with **claim 1** wherein (IIIa) is selected.

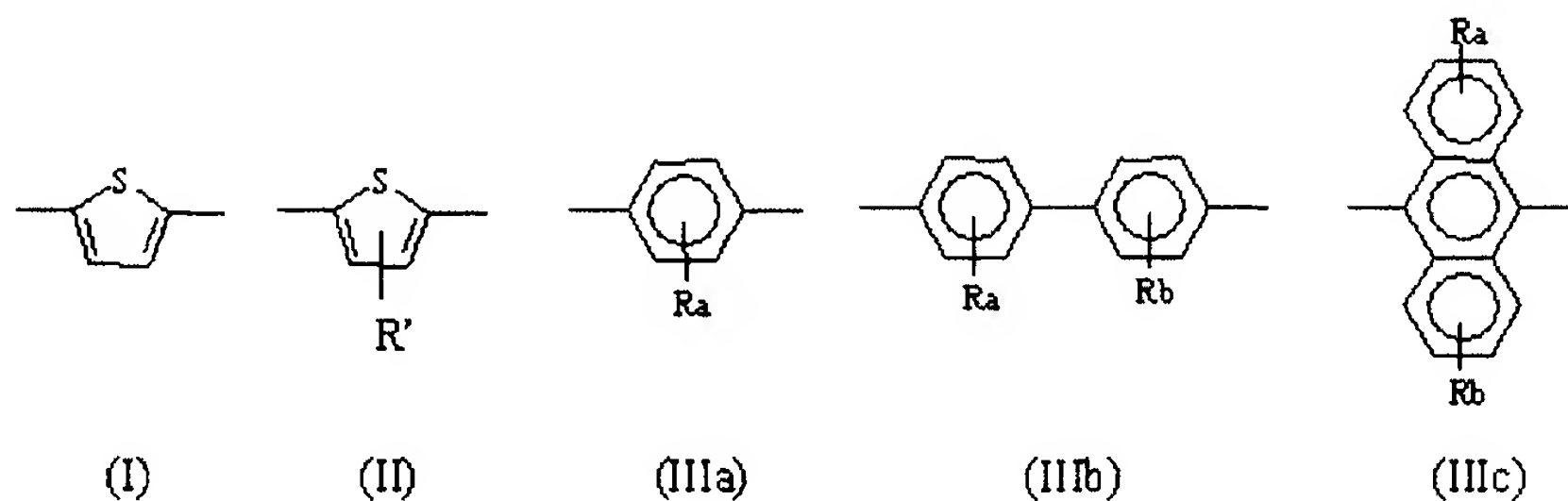
44. A device in accordance with **claim 1** wherein (IIIb) is selected.

45. A device in accordance with **claim 1** wherein (IIIc) is selected.

46. A device in accordance with **claim 21** wherein (IV-a) is selected.

47. A device in accordance with **claim 21** wherein (IV-b) is selected.

48. A thin film transistor comprised of a 2,5-thienylene repeating segment of (I) or (II), and at least one arylene segment of (IIIa), (IIIb), or (IIIc)



wherein each R is independently an alkyl or an alkoxy side chain; R' is halogen, alkyl, or alkoxy, and a and b represent the number of R segments or groups.